

*Micrometrical Measures of Double Stars (Sixth Series).*  
By the Rev. T. E. Espin, M.A.

The stars measured in 1908 are mainly those of  $h$  which hitherto have remained unmeasured. The working list contains 203 stars of  $h$  between  $+40^\circ$  and  $+50^\circ$  in declination, and 107 of these have now been measured. In the list of various stars will be found ten pairs entered in column 1 as Arg. VI., followed by a number. These are from a list of fifty-three pairs collected from vol. vi. of the Bonn Observations which had not been noted previously to Argelander's Observations. Several of these have been rediscovered by modern observers. In some cases  $h$ 's place is in error, and the pair has then been searched for, and when identified the correct place is given, and an asterisk is affixed to the star. The star  $h\ 2063$  is identical with A 944 A C,  $h$ 's place being  $1^m$ . in R.A. too great; the star  $h\ 2510$  R.A.  $9^h\ 46^m\ 35^s$  Decl.  $+49^\circ\ 22'$  (1880) was searched for on the nights of March 23 and April 7, without result.

 *$h$ 's Stars.*

$h$ .	R.A. 1880.	Decl.	P.	D.	Mags.	Nights.	Date.
	$h$	$m$		$^\circ$	$'$		
1036	0 28.1	+42 13	81.9	6.22	9.2, 9.8	2	.054
1987	28.8	42 24	348.5	21.62	8.5, 11.0	3	.334
1044	33.7	43 3	318.4	21.84	9.0, 9.2	3	.338
1062*	53.0	48 56	106.4	9.90	8.8, 10.7	3	.042
1071	1 1.3	46 46	118.4	14.72	9.0, 11.5	2	.024
2057	28.9	45 45	42.9	11.02	9.0, 11.0	2	.015
2089	44.1	42 53	305.2	29.26	8.6, 9.0	3	.047
2117	2 4.7	44 6	30.1	8.09	Var.	3	.030 AB
			199.8	13.50	C=10.4	3	.030 AC
			285.1	24.43	D=11.7	3	.030 AD
2137	20.7	42 42	132.8	26.22	8.6, 9.9	3	.023
2141	22.2	44 57	141.7	10.95	11.0, 11.6	2	.068
2139	22.6	52 38	298.0	3.52	8.5, 8.6	2	.918 AB
			6.5	20.43	C=12.0	2	.918 AC
2147	28.9	45 32	166.5	9.82	9.3, 10.5	2	.055
2160	43.5	47 33	268.3	8.02	10.1, 11.2	2	.063
2162	46.9	43 3	38.5	12.72	9.4, 9.6	3	.040 AB
2163			6.6	10.30	11.3, 12.7	3	.040 CD
			52.8	68.78		3	.040 AC
2167	53.1	44 25	33.9	36.87	8.8, 9.5	3	.015
2297*	6 5.3	48 38	17.8	8.60	10.0, 11.5	1	.066

*h's Stars—continued.*

<i>h.</i>	R.A. 1880. Decl.		P.	D.	Mags.	Nights.	Date. 1908.
	<i>h</i>	<i>m</i>	<i>°</i>	<i>°</i>	"		
2342	6	43.9	49 40	49.3	21.60	8.3, 13.8	2 ·083 AB
				74.6	27.90	14.2	2 ·083 AC
1160	8	15.2	47 9	150.4	28.75	8.8, 12.0	2 ·250
1161		25.2	46 20	28.2	19.85	9.5, 13.5	1 ·255
2457		30.5	47 54	263.7	14.25	10.0, 13.0	1 ·255
				289.9	28.40	13.3	1 ·255
1165	9	8.4	45 26	116.0	24.67	8.5, 12.2	2 ·235
2488		8.7	48 1	226.2	9.40	12.5, 12.8	1 ·255
2503		36.6	49 2	155.7	36.52	9.2, 9.3	2 ·238
1171	40	7	47 20	183.6	15.57	9.5, 11.2	2 ·238
5478		53.9	45 34	41.4	11.00	9.5, 11.0	1 ·266
2522	10	4.5	48 27	147.3	28.82	9.0, 11.2	2 ·253
2546		45.0	48 42	56.4	6.97	9.5, 10.8	3 ·280
2554		56.9	44 58	278.3	49.02	7.7, 8.9	2 ·253
1184		59.1	46 38	30.7	15.90	9.5, 14.5	2 ·253
				105.9	30.62	12.7	2 ·253
2622	12	48.8	43 28	329.3	26.25	9.2, 12.1	2 ·260
2623		49.0	43 33	156.3	23.35	9.3, 12.3	2 ·260
1223		53.7	43 24	191.5	20.57	8.6, 10.7	2 ·360
2632		57.6	47 22	347.1	30.75	9.1, 13.2	2 ·388
2634		57.9	48 23	60.1	30.85	9.1, 11.2	3 ·390
2642	13	2.7	49 55	173.8	9.65	9.3, 9.8	1 ·402
2667		32.8	48 52	3.2	13.00	9.5, 9.7	2 ·349
2675		38.1	47 46	295.2	10.90	11.3, 12.3	3 ·390
2680		41.3	46 0	153.9	22.27	9.3, 10.5	2 ·444
2697		56.2	46 59	293.4	23.75	9.2, 11.0	2 ·389
2720	14	19.5	47 1	31.3	21.12	9.0, 13.3	3 ·384
2752		47.1	45 6	121.9	5.58	8.3, 9.0	3 ·372
2759		53.2	45 59	92.1	12.90	9.5, 13.7	2 ·383
2768	15	4.4	45 37	114.8	20.75	10.2, 11.1	2 ·383
2781		22.6	49 38	325.5	22.30	9.3, 11.5	2 ·396
1274		26.4	42 39	311.0	6.07	9.3, 9.5	2 ·446
1418	19	30.0	49 46	10.4	29.95	8.9, 9.1	2 ·861
1419		30.2	47 51	38.6	6.95	10.5, 12.0	2 ·861
1478(1)		59.8	43 40	221.8	15.97	9.3, 9.4	2 ·831
(2) 20	0.3	43 39	337.5	8.00	11.0, 11.5	1 ·832	
1488*		6.9	45 25	121.5	9.97	10.1, 10.2	2 ·840
1558		34.8	48 5	205.9	4.45	9.0, 11.0	2 ·901
1666	21	31.1	43 0	234.9	9.32	10.1, 10.8	2 ·858

## Notes.

- h* 1044 *h*  $324^{\circ}5$ , Cin :  $1879^{\circ}6$ ,  $318^{\circ}8$ ,  $21''9$ .  
*h* 1062 This is B.D. +  $48^{\circ}311$ . *h*'s Decl. requires a correction of  $+20'$ .  
*h* 2117 Observations on fifteen nights show that either A or B is variable to the extent of about half a magnitude, and that the period is short.  
*h* 2297 *h*'s place requires a correction of  $+40$  sec. in R.A.  
*h* 2342 Both *comites* are difficult to measure on account of their faintness.  
*h* 2488 The N. star is distinctly the brighter.  
*h* 1184 The nearer *comes* is extremely difficult to measure.  
*h* 2667 This is B.D. +  $48^{\circ}$ ,  $3136$ .  
*h* 2752 The only measures are—

	P.	D.	Date.
<i>h</i>	$131^{\circ}2$	"	
Ma	$126^{\circ}3$	$5^{\circ}44$	1843.32
$\beta$	$126^{\circ}5$	$5^{\circ}84$	1878.26
Es	$121^{\circ}9$	$5^{\circ}58$	1908.37

- h* 1274 This is B.D. +  $42^{\circ}$ ,  $2604$ , and *h*'s place requires a correction of  $+20'$  in declination.  
*h* 1478 The second of these two pairs agrees with *h*'s place, but his angle of  $228^{\circ}\pm$ , which he says is estimated from a doubtful diagram, agrees with the first. Probably some confusion arose between the two pairs in the same low-powered field. The actual places of the pairs and *h*'s double are as follows:—

	R.A. 1855 <sup>o</sup> .			Decl.
	h	m	s	.
(1)	19	58	$58^{\circ}3$	$+43^{\circ}35'1$
(2)		59	$29^{\circ}5$	$43^{\circ}34'2$
<i>h</i> 1478		59	$28^{\circ}1$	$43^{\circ}35'5$

- h* 1488 This is B.D. +  $45^{\circ}3079$ .

## Various Stars.

Name.	R.A. 1880.	Decl.	P.	D.	Mags.	Nights.	Date.
	h m						
$\eta$ Cassiopeiae	0 $41^{\circ}7$	$+57^{\circ}11'$	$239^{\circ}8$	$5^{\circ}80$		3	1908.723
$\Sigma$ 70	...	...	$46^{\circ}9$	$52^{\circ}2$	$245^{\circ}5$	$7^{\circ}90$	2.884 AB
					$86^{\circ}8$	$1^{\circ}90$	11.0, 11.5
					$148^{\circ}2$	$80^{\circ}55$	3.889 CD
Espin 45	...	$54^{\circ}5$	$48^{\circ}54'$	$245^{\circ}4$	$7^{\circ}68$	$6^{\circ}8, 10^{\circ}7$	3.884 AC
							3.055

*Various Stars—continued.*

Name.	R.A. 1880. h m	Decl.	P.	D.	Mags.	Nights.	Date. 1908.
Arg. VI. 3	... 1 8.8	42 17	293.5	12.48	9.2, 9.5	3	.871 BC
			101.8	35.10	A = 8.3	3	.871 AB
			97.2	22.87		3	.871 AC
Arg. VI. 4	... 19.6	48 31	158.1	11.13	9.5, 10.2	2	.824
β—	... 43.9	52 14	265.5	3.92	9.5, 10.1	3	.777 BC
			342.5	50.16	A = 9.0	3	.777 AB
A 1527	... 54.0	43 5	238.1	4.33	8.2, 11.1	3	.061
Arg. VI. 7	... 2 17.1	51 50	244.1	17.03	8.8, 9.2	2	.854
A.G. (Bonn)	... 26.1	43 38	290.7	15.45	9.1, 9.2	2	.041 AB
			35.4	18.70	C = 10.8	2	.072 AC
			248.5	32.82	D = 14.0	2	.072 AD
A.G. (Harvard)	3 53.3	54 7	325.4	19.38	8.8, 9.2	2	.984
Σ 599	... 4 42.4	44 46	335.3	9.83	8.0, 9.0	3	.079 AB
			67.2	14.55	C = 14.0	3	.079 BC
A 1571	... 5 51.1	43 58	91.4	4.52	8.0, 12.2	3	.053
Hu 711	... 7 46.4	48 28	199.9	4.06	7.9, 11.2	4	.158
Σ 1242	... 8 27.6	47 32	170.7	2.64	8.8, 9.0	1	.266
Σ 1289	... 46.7	44 3	3.4	3.74	7.5, 8.0	1	.266
Σ 1358	... 9 23.1	45 12	161.9	23.45	7.5, 8.5	1	.266
Σ 1394	... 49.6	46 29	244.3	3.79	8.5, 8.8	1	.266
Ku 39	... 11 30.8	48 8	24.6	2.54	9.5, 9.6	1	.266
A.G. 190	... 13 30.8	50 16	10.3	2.87	9.0, 9.2	2	.444
Swift	... 57.7	46 55	7.5	2.52	9.0, 9.2	5	.369
Ku 54	... 16 39.3	44 8	96.9	9.07	8.4, 9.0	3	.389
O. Stone	... 17 25.2	46 22	184.8	7.60	9.3, 9.4	1	.381
A 1880	... 35.6	52 40	114.7	2.57	8.7, 10.2	3	.481
A 1886	... 57.4	53 16	340.3	4.75	8.7, 9.2	2	.563
A.G. (Harvard)	18 9.1	51 8	90.0	14.09	9.2, 10.0	1	.832 BC
			340.2	14.70	A = 8.5	1	.832 AC
			306.3	23.72		1	.832 AB
Arg. VI. 35	... 20.9	51 36	202.4	2.40	8.3, 8.4	4	.504 AB
(Espin 187)	...		118.6	85.44	C = 9.0	3	.484 AC
Arg. VI. 37	... 19 5.5	44 51	236.6	17.56	9.3, 11.3	3	.777 AB
			334.0	26.38	C = 9.7	3	.777 BC
Arg. VI. 40	... 42.1	46 5	163.7	26.67	8.2, 12.0	1	.753 AB
			317.8	29.84	C = 9.3	2	.720 AC
Arg. VI. 41	... 50.1	49 20	270.0	15.25	9.3, 9.5	2	.750
U Cygni	... 20 15.9	47 31	51.4	62.52	Var.	8.0	.749
Arg. VI. 46	... 21.4	41 31	312.9	46.74	9.0, 9.5	1	.769

## Various Stars—continued.

Name.	R.A. 1880. h m	Decl.	P.	D.	Mags.	Nights.	Date.
		°	°	"			1908.
Espin 139	... 21 17.3	52 52	349.0	6.00	9.4, 10.6	2	.924
A.G. (Bonn)	... 30.0	42 50	112.7	14.13	8.5, 9.0	2	.858
Arg. VI. 49	... 44.3	42 8	341.4	25.67	9.2, 9.6	3	.778
Arg. VI. 52	... 22 31.2	45 25	135.9	12.50	9.2, 10.2	2	.762 AB
			215.8	16.66	C = 9.8	3	.764 AC
A.G. (Harvard)	43.5	53 31	135.7	2.95	8.5, 8.8	2	.955
β—	... 45.5	52 28	172.3	4.40	9.2, 10.0	2	.932 AB
			224.9	25.47	C = 9.5	2	.932 AC

## Notes.

Σ 70. There are no other measures of the distant double *comes* which had been previously seen by β.

β—. This was measured as new, but had been previously measured by β, under *h* 2085 Gen. Cat., No. 994.

Σ 599. The *comes* C had been already measured by β.

A 1527, A 1571. These stars were detected and measured before Professor Aitken's results reached me.

O. Stone. This is B.D. +46°, 2316.

A. 1880, A 1886. The discovery of these two pairs and measures of them were published in the Journal of the R.A.S. of Canada, vol. ii. No. 5 (September–October). This appeared when Professor Aitken's thirteenth list of New Double Stars was already in type. To save duplication, I have struck them out of my list of new pairs.

U Cygni. All the measures are—

Date.	P.	D.	Nights.
Tarrant 1886.901	51.2	62.68	4
Espin 1892.797	52.3	62.70	2
„ 1908.749	51.4	62.52	2

β—. Measured as new in the first instance, but it had already been measured by β (see Gen. Cat., vol. ii. p. 1004).

## New Double Stars. By the Rev. T. E. Espin, M.A.

No.	B.D.	R.A. 1900.	Decl.	P.	D.	Mags.	Nights.	Date.
								1908.
610	+54, 3111	0 1.2	+54 27	203.4	4.20	9.4	11.2	2 .941
611	+53, 3289	1.6	53 56	292.2	10.50	8.4	10.1	2 .872
612	+54, 32	13.3	54 19	266.0	2.90	9.3	9.5	2 .988
613	+52, 79	24.0	52 50	270.6	8.25	8.3	11.8	3 .744
614	+52, 182	46.6	53 11	86.8	2.23	9.5	9.8	3 .748
615	+53, 190	53.1	53 22	267.4	3.27	9.1	11.7	2 .802
616	+53, 223	1 0.6	53 53	278.1	3.35	9.4	10.3	3 .846
	+53, 326	26.3	54 14	195.4	16.15	8.6	8.8	2 .907
	+53, 327	26.8	53 46	28.1	15.33	8.7	9.0	2 .907
617	+54, 324	29.7	54 27	304.9	3.27	9.1	9.2	2 .852
618	+53, 491	2 10.5	53 41	173.1	3.65	9.3	11.6	3 .895
619	+45, 600	15.1	45 57	243.6	5.55	8.0	10.7	2 .828
620	+53, 546	28.5	53 15	212.7	6.12	8.5	12.0	2 .916
621	+53, 601	52.5	53 56	354.1	8.25	8.4	11.5	3 .917
622	+53, 680	3 28.1	53 34	34.1	4.62	9.1	9.9	3 .915
623	+53, 705	43.7	53 15	331.2	8.02	8.5	13.9	2 .941
624	h 2770	15 9.8	47 14	49.6	2.30	10.0	10.1	3 .386 AB
				129.3	16.57	C =	10.5	2 .383 AC
	+49, 2363	9.5	48 57	343.0	25.75	7.0	10.2	2 .401
625	+44, 2454	17.7	44 40	252.9	1.57	9.3	10.3	2 .413
626		38.0	50 28	275.0	7.52	9.2	9.2	2 .469
627	+51, 2073	16 16.0	51 34	286.5	11.07	8.6	9.8	2 .472
628	+52, 1959	17.3	52 0	265.7	3.37	8.8	12.0	2 .472
629	+52, 1961	18.0	52 4	93.2	10.20	8.1	13.0	2 .472
630	+54, 1813	25.4	54 28	44.7	5.47	9.0	13.5	2 .517
631	+43, 2621	32.1	43 38	162.1	9.77	8.2	11.0	2 .401
632		38.2	50 25	102.9	1.75	9.3	10.0	2 .469
633	+42, 2783	58.4	42 52	258.9	6.30	7.0	11.5	2 .412
634	+42, 2789	17 0.8	42 20	98.0	1.80	9.4	10.0	2 .444
635	+52, 2075	33.0	52 14	241.7	5.77	8.9	12.0	2 .568
636		33.4	41 46	124.4	2.38	9.2	9.7	3 .517
637	+54, 1898	34.2	54 29	296.4	3.70	9.2	9.3	2 .489
638	+54, 1902	38.2	54 14	188.2	2.57	9.2	11.0	4 .530
639	+56, 2019	44.3	56 16	76.1	8.00	8.8	9.9	2 .598
640	+54, 1931	58.8	54 53	75.6	7.90	8.6	9.2	2 .552
641	+54, 1937	18 2.8	54 34	66.7	1.95	9.2	9.4	3 .602
642	+51, 2327	8.5	51 38	273.8	6.75	9.0	13.0	2 .650
643	+55, 2039	10.9	55 54	50.3	3.40	9.0	11.2	2 .565
644	+52, 2167	11.2	52 27	32.0	9.97	8.5	14.0	2 .640
645	+53, 2054	11.7	53 39	89.1	2.75	8.2	12.0	3 .560
646	+52, 2175	12.9	52 5	197.2	9.88	8.0	13.8	3 .654
647	+50, 2561	15.8	50 47	293.4	2.80	9.0	11.3	3 .776
648	+52, 2197	19.8	52 18	5.2	4.68	9.0	13.7	4 .666
649	+53, 2074	19.9	53 31	316.5	8.32	9.2	11.5	2 .624